

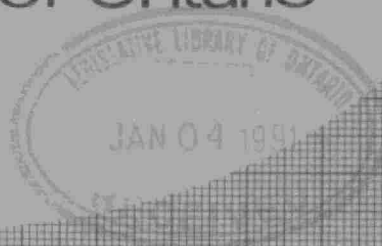
CA20N
EV 505
1972
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Ministry of the ENVIRONMENT

Fumigation with Calcium Cyanide
in the Province of Ontario

1972

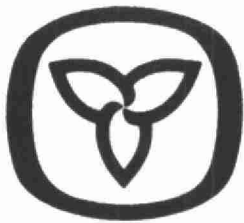


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Environment Ontario

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FUMIGATION WITH CALCIUM CYANIDE
IN THE
PROVINCE OF ONTARIO



PESTICIDES CONTROL SERVICE
MINISTRY OF THE ENVIRONMENT

A C K N O W L E D G M E N T

I wish to acknowledge with great appreciation the valuable assistance and critical review of this booklet by the following persons: Dr. G.S. Cooper, Technical Director, Cyanamid of Canada, Rexdale, Ontario, and Mr. W. L. Smith, Chief, Pesticides Control Service, Ontario Ministry of the Environment.

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CALCIUM CYANIDE

Chemical Name ----- $\text{Ca}(\text{CN})_2$

Molecular Weight ----- 92.1

Generic Name ----- Calcium Cyanide

Physical Properties ----- A grey granular powder
or a fine dust.

Chemical Properties ----- Decomposed by moisture
to give calcium hydrox-
ide and hydrocyanic
acid (HCN) a decomposi-
tion proceeding at humi-
dities as low as 25% RH

Specific Gravity of HCN gas (air = 1)----- 0.9 (slightly lighter
than air)

Toxicity of Calcium Cyanide ----- Acute: mice - 0.005 mg/
kg; dogs - 4 mg/kg; rabbits
4 mg/kg; rats 10 - 15
mg/kg.

Toxicity for HCN (threshold limit for
inhalation for 8 hr. daily exposure)----- 10 ppm volume (ACGIH
1968)

Flamability limits of gas in air ----- 6 to 41% by volume
(well above normal
fumigation concentrat-
ions)

(Toxicity information supplied by Dr. G. S. Cooper, Cyanamid of
Canada Limited, Rexdale, Ontario.)

H Y D R O C Y A N I C A C I D

INTRODUCTION

Hydrocyanic acid gas is classified by the Pesticides Act, 1967, and Ontario Regulation 445/67 as a Group A Substance which is used as a fumigant and made up of hydrocyanic acid gas and cyanide compounds and is extremely poisonous. Poisoning may result from inhalation, swallowing, and from contact with mucous membrane or contact with the skin.

Hydrocyanic acid is flammable when in concentration in air between 6% - 41% by volume. It can be ignited by open flame, hot surface or spark. It forms an explosive mixture with air when the concentration reaches the above limits.

In working with this fumigant, great care must be taken to extinguish all flames and turn off the electric switches before treatment begins.

FUMIGATION WITH CYANOGAS "G" (CALCIUM CYANIDE)

1. Calcium cyanide is a compound which, when it comes into contact with moisture in the air or water, releases deadly hydrocyanic acid gas. In order to use hydrocyanic acid gas or a cyanide compound for extermination in Ontario, a person must be licensed under the Pesticides Act and Regulations.

In using cyanogas as a fumigant, certain procedures are dictated by the regulations under the Pesticides Act and by a common sense approach to the handling of a toxic substance like hydrocyanic gas, it can be fairly safe to use. Any deviation from these procedures can lead to a serious accident or cause death. Hydrocyanic acid gas is such that most accidents are fatal.

EQUIPMENT NECESSARY

- (a) A gas mask with a canister approved by the U.S. Bureau of Mines for use with HCN. An industrial facepiece should be used (a war surplus facepiece is not recommended). Do not use the same canister for HCN that you use for methyl bromide unless it has been checked by your supplier or approved for both.
- (b) Signs 14" x 10" bearing the word DANGER 2½ inches high in red on a white background and saying that an extermination with cyanogas is taking place inside.
- (c) Locks for all doors of the building.
- (d) Methyl orange litmus paper.
- (e) First aid kit with amyl nitrite pearls.

GENERAL PRECAUTIONS FOR HANDLING CYANOGEN

Cyanogen is a highly toxic material and should always be handled with care. The gas is lighter than air, so that, unless confined, it dissipates into the atmosphere. Special precautions must be observed when using cyanogen indoors.

Cyanogen can be used in such outdoor work as treating rodent burrows with relative safety. The gas evolves slowly and dissipates relatively rapidly, if only small quantities are used. In large scale open air dusting, operators should take care not to remain in drifting dust and should have a gas mask at hand.

THE FOLLOWING RULES MUST BE OBSERVED

- (a) Keep away from food and feed.
- (b) Avoid contact with the skin; wash hands after handling Cyanogen.
- (c) Avoid breathing gas or dust by standing to windward when loading foot pump or duster, or when applying Cyanogen outdoors.
- (d) Keep Cyanogen containers tightly closed when not in use. Keep away from acids.
- (e) Store in a dry place, beyond the reach of children, irresponsible persons, domestic animals and poultry.
- (f) Where applied to rodent burrows closely adjoining roots of grass or ground hog holes near shrubs or trees as in treating moles in gardens, cyanogen may injure grass, shrubs or trees by its contact with the roots. But since the unchecked destructiveness can ruin a fine lawn or garden and because injury by cyanogen is so rare, the exterminator may use cyanogen to stop this continuous destruction and rely upon reseedling and replanting in the few instances where injury occurs.

PRECAUTIONS FOR ENCLOSED SPACE FUMIGATION

UNDER NO CIRCUMSTANCES SHOULD DWELLING HOUSES OR ANY PLACE OF HUMAN HABITATION BE FUMIGATED WITH CYANOGEN, EXCEPT BY LICENSED FUMIGATORS.

Cyanogas G-Fumigant is the only granulation that is suitable for indoor fumigation. Cyanogas "Discards" are also used for this purpose. Indoor or "enclosed space" fumigation must not be attempted until the operator has first carefully read the precautions indicated in this paragraph. These are found in the Ontario Pesticides Act and Regulations. Fumigators must make sure all human beings and domestic animals are excluded from every part of the building during fumigation and thereafter until the premises have been aired sufficiently to eliminate the gas. Local regulations governing indoor fumigation must be strictly adhered to.

Confined in an enclosed space in sufficient quantity, a concentration of gas is built up which is poisonous to human beings as well as to animal and insect life. The use of a mask expedites the process of opening up for ventilation. When fumigating a building with cyanogas, each operator should be equipped with a supply of Amyl Nitrite Pearls for emergency use. (See Antidotes and First Aid).

SOURCE OF IGNITION

Because of the possible development of pockets having high concentrations of HCN gas which may be within the flammable range of HCN, care should be taken to eliminate all sources of ignition including fires, pilot lights and electrical sparks, when fumigating enclosed spaces with cyanogas.

STEP-BY-STEP PROCEDURE FOR ENCLOSED SPACE FUMIGATION

- (1) Take careful measurements of the building to be fumigated in order to determine the total number of cubic feet - (average height x length x width of each floor). Apply the dosage of Cyanogas suggested here below.
- (2) The temperature in the space to be fumigated should not be below 65°F. Insects become inactive as the temperature drops below 65°F., usually becoming dormant at 55°F. Under very dry conditions (relative humidity 30% or less) hang damp newspapers, rags or flour sacks on walls or ceilings, to increase the humidity. If necessary to resort to artificial heat, hang wet rags or flour sacks over the heating devices. These measures will afford sufficient humidity to increase the evolution of gas in sufficient quantity.

- (3) For the control of insects, use cyanogas at the rate of 2 pounds per 1,000 cubic feet of space. To kill rats and mice only, a dosage of $\frac{1}{2}$ pound cyanogas per 1,000 cubic feet of space will suffice.
- (4) Close and seal all ventilators or windows to prevent loss of the gas. See that all windows and doors, except those through which the operators will make their exit are closed and locked. For convenience in airing out the building safely after fumigation, windows on opposite sides of each floor should be arranged to open from the outside.
- (5) Do not fumigate any part of a building until you have made sure by personal inspection that all persons and useful animals are out of the entire building, and out of any adjoining buildings into which gas might penetrate. Remove gold fish, potted plants, fatty or liquid foods, as well as fresh vegetables and fruits as all these articles may be injured by the high concentration of gas which is used. Place guards at the locked exit doors with orders to allow no one to enter. TWO MEN SHOULD WORK TOGETHER. UNDER NO CIRCUMSTANCES SHOULD ONE MAN ATTEMPT TO WORK ALONE.
- (6) Distribute cans of cyanogas (G-Fumigant) on the floor in proportion to the material needed in each place. Loosen container lids, but do not remove them until ready to spread the cyanogas. Spread newspapers on the floor alongside each can of cyanogas.
- (7) Put on gas mask and start applying cyanogas. Spread cyanogas directly from the can onto the newspapers in a layer not greater than $\frac{1}{8}$ inch depth. Start at the top floor (if more than one floor) and work down, skipping the main floor and doing the basement. Then, fumigate the main floor after the basement. On each floor, start applying the cyanogas at the farthest point from the exit, working toward the exit, thus working away from the gas. DO NOT RETURN OR PASS OVER THE FLOOR WHERE CYANO GAS HAS ALREADY BEEN SPREAD.
- (8) When the entire building has been treated, leave immediately, making sure that all operators are out, and then lock the building securely so that no one can enter. Place warning signs at all entrances to the building, warning all persons not to enter. Keep guards on duty during the entire period of fumigation and until premises have been thoroughly ventilated. BUILDING SHOULD BE ALLOWED TO REMAIN UNDER FUMIGATION FOR 12 to 24 HOURS.

VENTILATION

- (a) Gas masks must be worn during the entire period of opening the building.
- (b) The front and rear doors should be first opened from outside. Open all windows which can be reached from the outside.
- (c) After ventilation has been in progress for one or two hours, the operators (wearing gas masks) should enter the building and open additional windows; but they should not remain in the building until it has been thoroughly aired.
- (d) It is important to have guards at entrances during ventilation to keep anyone from entering the building.
- (e) Specific information as to the length of time required for ventilation cannot be given to meet all cases. Much depends upon the movement of air currents, the humidity of the air, and the rate of gas leakage from the building during the hours of fumigation. To be absolutely safe, buildings should be ventilated until there is no odour of gas, before persons are allowed to enter. If any amount of sacked or packaged material is stored in the building it will have absorbed the gas and sufficient time should be allowed for this absorbed gas to be dissipated before the material is used.
- (f) ALL BEDDING, MATTRESSES, PILLOWS AND COVERINGS, should be beaten and aired OUT OF DOORS until the last traces of gas have disappeared.
- (g) After the gas has evolved, the cyanogas residue should be cleaned up and buried.

TEST WITH METHYL ORANGE PAPER

The use of Methyl Orange test papers is an aid in determining the presence or absence of HCN. These are small strips of paper of an orange colour, which in the presence of an atmosphere containing HCN, turn pink or red and are very sensitive to relatively low concentrations of the gas. Competent authorities have determined that if methyl orange test papers do not change the colour as indicated here above within two minutes after exposure to a supposed concentration of HCN, the space is safe for human occupancy.

RATS

Rats In Burrows:

Pump cyanogas A-Dust into the burrow openings with a cyanogas foot pump. After a few strokes of the pump, dust will be seen to emerge from other connecting holes in the vicinity. Close these other holes from which dust emerges. Remove pump nozzle and block the hole into which the dust was pumped. Treat all visible burrows in the same way.

Rats Under Sidewalks and Pavements

Find entrance, and pump cyanogas dust into hideout. If no entrance can be found, probe under the walk for hollow spaces, which represent rat harborages. Keep all people and pets away from this operation for at least one hour after application.

Rats In Corn Crib

Inject cyanogas dust into the body of the corn through an iron water pipe by means of the cyanogas foot pump. The end of the iron pipe within the corn crib should be plugged, and a length of the pipe equal to the depth of the corn crib should be perforated with $\frac{1}{4}$ -inch holes, about 2 inches apart. Drive the pipe into the corn crib at intervals of about 2 feet; insert the metal nozzle of the cyanogas foot pump in the free end of the pipe, making sure a fairly air-tight joint is made, then pump cyanogas through the pipe. Stand on windward side of the crib while making this application, so that the wind will carry any dust away from the operator and into the corn. Cyanogas has no deleterious effect on the corn.

Rats In Poultry Houses, Barns and Other Farm Buildings

Remove from the building all animals and birds before the dusting operation, to prevent injury from the gas which might seep up through the floors. Treat all visible holes with cyanogas dust by means of a cyanogas foot pump, and block all other openings from which dust is seen to emerge. Air buildings well for three hours, and check with methyl orange test papers before reoccupying.

Rats In Buildings

When rats infest an entire building, close all openings in the building as tightly as possible, and scatter cyanogas on the floor at the rate of $\frac{1}{2}$ pound per 1,000 cubic feet of space. Fumigation should be done only when the building is entirely un-occupied. The building should remain under gas for at least 6 hours and then all aeration procedures followed.

WOODCHUCKS (Groundhogs)

Place one rounded tablespoonful of cyanogas dust or G-Fumigant as far down each burrow as possible. Use a long-handled spoon or a spoon fastened to a stick. Upset the spoon, spilling the cyanogas in a pile. Do not scatter it. Close the entrance tightly with upturned sod and try to prevent loose dirt from falling on the cyanogas. Treat woodchuck burrows preferably in the morning, and not later than mid-afternoon. Treat only burrows showing fresh signs of woodchuck activity.

MOLES

Make an opening every 5 to 10 feet along the entire system with a pointed stick. Start at one end of the runway and blow cyanogas dust into the openings in both directions with a cyanogas foot pump, until dust is seen to emerge from the nearest holes. The openings should then be covered with sod and the dust pumped into each succeeding hole from which dust has not emerged, until all have been treated and covered. Application should be made early in the morning or at dusk. Be sure to treat the entire system of a runway at the same time, even though it may extend to other property.

MICE

These may be treated with cyanogas dust, applied by means of the cyanogas foot pump, inserting the hose nozzle well into the burrow, then pulling it back about 1 inch to prevent the possibility of clogging. Give 2 to 3 pump strokes which will apply about one-third ounce of cyanogas per burrow. Remove the nozzle and close the entrance immediately with a clod of earth, stamping tightly shut with heel. If dust is seen escaping from nearby holes, close these too. Experimental Station work shows

100 holes can be treated in this manner in a matter of minutes.
DO NOT USE FOR MICE IN HOUSES.

POCKET GOPHERS

About 2 oz. of cyanogas dust or G-Fumigant per hole should be used. A large cooking spoon or four tablespoons will apply about 2 oz. A long handled spoon is most convenient but a short-handled spoon can be fastened to a stick. Close hole with a shovel full of upturned sod to confine the gas, but do not allow loose dirt to cover the cyanogas.

CARPENTER ANTS

These ants live in large colonies in the heart of the tree. To treat with cyanogas, locate entrances of the nest and blow cyanogas dust into the nest with the cyanogas foot pump or rubber-bulb hand duster. After the nest has been thoroughly treated, plug the openings with tree wax or tree putty.

WASPS, YELLOW JACKETS AND HORNETS

These can be easily destroyed by blowing cyanogas dust toward nest with a pump as one approaches. This will stupefy the wasps flying about the entrance of the nest, after which poke nozzle of pump into nest and treat thoroughly.

WILD BEES

To kill wild bees in houses, trees, rooks and cavities, blow cyanogas dust into cavity with pump until reasonably sure that the dust cloud has reached every part of the cavity. Close entrance if possible after treatment.

BEEKEEPER'S USES FOR CYANOOGAS

Bee Colonies

These may be destroyed by spreading a tablespoonful of cyanogas dust or "G-Fumigant" on a cardboard, and slipping this into the entrance of the hive. Close entrance wherever possible. Work should be done at night when bees are all in the hive and quiet. Diseased colonies must be burned after fumigation.

Bee Moths or Wax Worms

To fumigate combs to kill bee moth, stack the hives and place dosage of 4 pounds cyanogas "G-Fumigant" per 1,000 cubic feet of space, at the bottom of the stack. Expose at least 12 hours and repeat fumigation in 2 to 3 weeks.

POISONING

This gas is extremely toxic to humans and animals. It is soluble in water and is absorbed quite readily through the skin. HCN is very fast acting. If subjected to a lethal exposure a person may take only one or two breaths before collapsing. On the other hand if the patient recovers there is usually no after effects and recovery is rapid.

Acute Poisoning

Ingesting or inhaling large amounts of HCN (10 times minimum lethal dose) produces immediate unconsciousness, convulsions and death within one to fifteen minutes. Ingesting and inhaling or absorbing through the skin an amount near the minimum lethal dose causes dizziness, rapid respiration, headache, drop in blood pressure, rapid pulse and unconsciousness.

Chronic Poisoning

Inhaling small amounts of HCN may cause dizziness, weakness, congestion of the lungs, hoarseness, conjunctivitis, loss of appetite, weight loss and mental deterioration. HCN, however, is not accumulative and if removed from all exposure the symptoms will usually clear up.

FIRST AID (Inhaled Cyanide)

- (1) Remove to uncontaminated atmosphere.
- (2) Remove clothing and wash exposed skin with soap and water - keep patient warm.
- (3) Call a physician.
- (4) If patient is unconscious, break an amyl nitrite pearl in a piece of cloth and hold lightly to the patient's nose for 15 seconds. Repeat this five times at about 15 second intervals.

- (5) If patient stops breathing give artificial respiration until the doctor arrives and takes charge.

ANTIDOTE

(To be Administered by a Doctor)

- (a) As soon as possible give 10 millilitres of 3% sodium nitrite solution intravenously at the rate of 2.5 to 5 millilitres per minute. Stop administration if systolic blood pressure goes below 80 millimetres of mercury.
- (b) Follow sodium nitrite with 50 millilitres of 25% sodium thiosulphate solution intravenously at a rate of 2.5 to 5 millilitres per minute.
- (c) Be prepared to repeat treatments detailed in (a) and (b) if symptoms reappear.

STORAGE OF CYANOGAS

Tins of CYANOGAS must be stored under lock and key in a dry place. If tins show signs of rusting DO NOT keep them in your possession. Notify the nearest office of the Pesticides Control Service, or, CYANAMID OF CANADA LIMITED, Rexdale, Ontario, who will arrange with you, the disposal of the tin and contents.

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